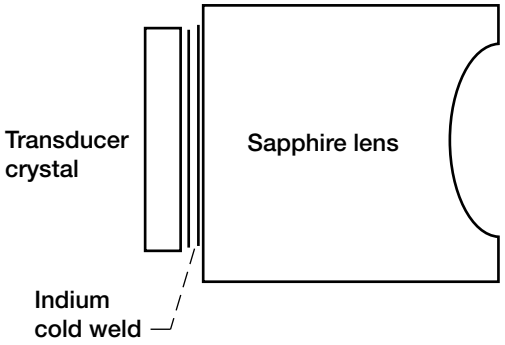
Technology Opportunity

Indium Cold Welding

NASA Lewis has developed an apparatus that cold-welds fragile crystal wafers and hard metallic or ceramic surfaces. Cold-welding is a method of joining parts without applying heat. This technique is used to mount extremely thin piezoelectric crystals to a sapphire lens to achieve high ultrasonic transmission.



Potential Commercial Uses

- Manufacturing high-frequency acoustic devices such as acoustic microscope transducers
- Manufacturing acousto-optical devices such as brag cells
- Cold-welding electronic integrated circuits and micromachine devices to supporting substrates
- Bonding parts that are too thin and fragile for conventional bonding methods
- Creating bonds that efficiently transmit thermal, acoustic, and electrical energy

Benefits

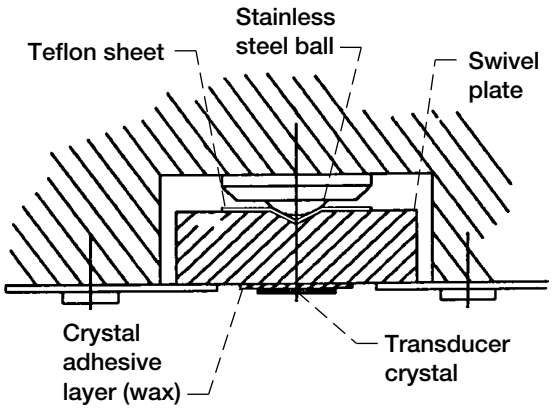
- Uses an existing vacuum chamber of a sputter- or vapor-deposition system
- Is simple mechanical operation with no electrical or hydraulic lines required
- Supports both coating and bonding operations in one setup
- Handles fragile crystal wafers without breaking them
- Maintains vacuum and protects parts from oxide contamination

The Technology

The apparatus is mounted on a turntable that moves the parts among the three coating stations. It holds the parts on which metal coatings are to be vapor-deposited. The coated parts are reoriented to face each other by a simple mechanical drive. Once aligned, the bonding force is applied by preloaded springs. A simple cam transfers the spring load into the parts. Application of coatings, alignment of parts, and bonding operations are all done in one setup.

Special alignment features

- Swivel plate self aligns and distributes compression loads to prevent high stress points.
- Spring clips permit easy loading and release.
- Special wax holds the crystal and takes up surface irregularities while absorbing side loads to prevent shear forces on the crystal.



National Aeronautics and Space Administration
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Options for Commercialization

A patent is pending; however, NASA will support the commercial development of this technology. Seeking to license the technology.

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Key Words

Indium
Cold welding
Ultrasonic transducer
Acoustic transducer fabrication
Lithium niobate
Acoustic lens

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